

## CLAIMS

What is claimed is:

1. An isolated polynucleotide that encodes a soluble receptor polypeptide comprising a sequence of amino acid residues that is at least 90% identical to the amino acid sequence as shown in SEQ ID NO:6, and

wherein the soluble receptor polypeptide encoded by the polynucleotide sequence binds a ligand comprising a polypeptide of SEQ ID NO:10 or SEQ ID NO:47, or antagonizes the ligand activity.

2. An isolated polynucleotide according to claim 1, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a homodimeric receptor complex.

3. An isolated polynucleotide that encodes a soluble receptor polypeptide comprising a sequence of amino acid residues that is at least 90% identical to the amino acid sequence as shown in SEQ ID NO:6, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a heterodimeric or multimeric receptor complex.

4. An Isolated polynucleotide according to claim 3, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a heterodimeric or multimeric receptor complex further comprising a soluble Class I cytokine receptor.

5. An isolated polynucleotide according to claim 3, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a heterodimeric or multimeric receptor complex further comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82).

6. An isolated polynucleotide according to claim 3, wherein the polypeptide further comprises a WSXWS motif as shown in SEQ ID NO:13.

7. An isolated polynucleotide that encodes a soluble receptor polypeptide comprising a sequence of amino acid residues as shown in SEQ ID NO:6, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a heterodimeric or multimeric receptor complex.

8. An Isolated polynucleotide according to claim 7, wherein the soluble receptor polypeptide encoded by the polynucleotide further comprises a soluble Class I cytokine receptor.

9. An isolated polynucleotide according to claim 7, wherein the soluble receptor polypeptide encoded by the polynucleotide forms a heterodimeric or multimeric receptor complex further comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82).

10. An isolated polynucleotide according to claim 7, wherein the soluble receptor polypeptide is encoded by the polynucleotide as shown in SEQ ID NO:7.

11. An isolated polynucleotide according to claim 3, wherein the soluble receptor polypeptide further comprises an affinity tag.

12. An expression vector comprising the following operably linked elements:

(a) a transcription promoter; a first DNA segment encoding a soluble receptor polypeptide having an amino acid sequence as shown in SEQ ID NO:6; and a transcription terminator; and

(b) a second transcription promoter; a second DNA segment encoding a soluble Class I cytokine receptor polypeptide; and a transcription terminator; and

wherein the first and second DNA segments are contained within a single expression vector or are contained within independent expression vectors.

13. An expression vector according to claim 12, further comprising a secretory signal sequence operably linked to the first and second DNA segments.

14. An expression vector according to claim 12, wherein the second DNA segment encodes a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha$ ' receptor polypeptide (SEQ ID NO:82).

15. A cultured cell comprising an expression vector according to claim 12, wherein the cell expresses the polypeptides encoded by the DNA segments.

16. A cultured cell comprising an expression vector according to claim 12, wherein the first and second DNA segments are located on independent expression vectors and are co-transfected into the cell, and cell expresses the polypeptides encoded by the DNA segments.

17. A cultured cell into which has been introduced an expression vector according to claim 12, wherein the cell expresses a heterodimeric or multimeric soluble receptor polypeptide encoded by the DNA segments.

18. A cell according to claim 15, wherein the cell secretes a soluble receptor polypeptide heterodimer or multimeric complex.

19. A cell according to claim 15, wherein the cell secretes a soluble receptor polypeptide heterodimer or multimeric complex that binds a ligand comprising a polypeptide of SEQ ID NO:10 or SEQ ID NO:47, or antagonizes the ligand activity.

20. A DNA construct encoding a fusion protein comprising:  
a first DNA segment encoding a polypeptide having a sequence of amino acid residues as shown in SEQ ID NO:6; and  
at least one other DNA segment encoding a soluble Class I cytokine receptor polypeptide,

wherein the first and other DNA segments are connected in-frame; and  
wherein the first and other DNA segments encode the fusion protein.

21. A DNA construct encoding a fusion protein according to claim 20, wherein at least one other DNA segment encodes a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82).

22. An expression vector comprising the following operably linked elements:

a transcription promoter;

a DNA construct encoding a fusion protein according to claim 20; and

a transcription terminator,

wherein the promoter is operably linked to the DNA construct, and the DNA construct is operably linked to the transcription terminator.

23. A cultured cell comprising an expression vector according to claim 22, wherein the cell expresses a polypeptide encoded by the DNA construct.

24. A method of producing a fusion protein comprising:

culturing a cell according to claim 23; and

isolating the polypeptide produced by the cell.

25. An isolated soluble receptor polypeptide comprising a sequence of amino acid residues that is at least 90% identical to an amino acid sequence as shown in SEQ ID NO:6, and

wherein the soluble receptor polypeptide binds a ligand comprising a polypeptide of SEQ ID NO:10 or SEQ ID NO:47, or antagonizes the ligand activity.

26. An isolated polypeptide according to claim 25, wherein the soluble receptor polypeptide forms a homodimeric receptor complex.

27. An isolated polypeptide comprising a sequence of amino acid residues that is at least 90% identical to an amino acid sequence as shown in SEQ ID NO:6, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex.

28. An isolated polypeptide according to claim 27, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex further comprising a soluble Class I cytokine receptor.

29. An isolated polypeptide according to claim 27, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex further comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82).

30. An isolated polypeptide according to claim 27, wherein the polypeptide further comprises a WSXWS motif as shown in SEQ ID NO:13.

31. An isolated soluble receptor polypeptide comprising a sequence of amino acid residues as shown in SEQ ID NO:6, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex.

32. An isolated polypeptide according to claim 31, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex further comprising a soluble Class I cytokine receptor.

33. An isolated polypeptide according to claim 31, wherein the soluble receptor polypeptide forms a heterodimeric or multimeric receptor complex comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82).

34. An isolated polypeptide according to claim 31, wherein the soluble receptor polypeptide further comprises an affinity tag, chemical moiety, toxin, or label.

35. An isolated heterodimeric or multimeric soluble receptor complex comprising soluble receptor subunits, wherein at least one of soluble receptor subunits comprises a soluble receptor polypeptide comprising a sequence of amino acid residues as shown in SEQ ID NO:6.

36. An isolated heterodimeric or multimeric soluble receptor complex according to claim 35, further comprising a soluble Class I cytokine receptor polypeptide.

37. An isolated heterodimeric or multimeric soluble receptor complex according to claim 35, further comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4) or a soluble IL-13 $\alpha$  receptor polypeptide (SEQ ID NO:82).

38. A method of producing a soluble receptor polypeptide that form a heterodimeric or multimeric complex comprising:

culturing a cell according to claim 15; and

isolating the soluble receptor polypeptides produced by the cell.

39. A method of producing an antibody to a soluble receptor polypeptide comprising:

inoculating an animal with a soluble receptor polypeptide complex selected from the group consisting of:

(a) a polypeptide comprising a homodimeric soluble receptor complex comprising SEQ ID NO:6;

(b) a polypeptide comprising a soluble receptor heterodimeric or multimeric receptor complex comprising SEQ ID NO:6;

(b) a polypeptide comprising a soluble receptor heterodimeric or multimeric receptor complex comprising SEQ ID NO:6, and further comprising a soluble Class I cytokine receptor polypeptide;

(c) a polypeptide comprising a soluble receptor heterodimeric or multimeric receptor complex comprising SEQ ID NO:6, and further comprising a soluble IL-2R $\gamma$  receptor polypeptide (SEQ ID NO:4);

(d) a polypeptide comprising a soluble receptor heterodimeric or multimeric receptor complex comprising SEQ ID NO:6, and further comprising a soluble IL-13 $\alpha'$  receptor polypeptide (SEQ ID NO:82); and

wherein the polypeptide complex elicits an immune response in the animal to produce the antibody; and

isolating the antibody from the animal.

40. An antibody produced by the method of claim 39, which specifically binds to a homodimeric, heterodimeric or multimeric receptor complex comprising a soluble receptor polypeptide comprising SEQ ID NO:6.

41. The antibody of claim 40, wherein the antibody is a monoclonal antibody.

42. An antibody which specifically binds to a homodimeric, heterodimeric or multimeric receptor complex according to claim 35.

43. A method for inhibiting a ligand comprising a polypeptide of SEQ ID NO:10 or SEQ ID NO:47, or antagonizing the ligand activity-induced proliferation of hematopoietic cells and hematopoietic cell progenitors comprising culturing bone marrow or peripheral blood cells with a composition comprising an amount of soluble receptor comprising SEQ ID NO:6 sufficient to reduce proliferation of the hematopoietic cells in the bone marrow or peripheral blood cells as compared to bone marrow or peripheral blood cells cultured in the absence of soluble receptor.

44. The method of claim 43, wherein the hematopoietic cells and hematopoietic progenitor cells are lymphoid cells.

45. The method of claim 44, wherein the lymphoid cells are NK cells or cytotoxic T cells.

46. A method of reducing proliferation of neoplastic B or T cells comprising administering to a mammal with a B or T cell neoplasm an amount of a composition of soluble receptor comprising SEQ ID NO:6 sufficient to reduce proliferation of the neoplastic B or T cells.

47. A method of suppressing an immune response in a mammal exposed to an antigen or pathogen comprising:

- (1) determining a level of an antigen- or pathogen-specific antibody;
- (2) administering a composition of soluble receptor polypeptide comprising SEQ ID NO:6 in an acceptable pharmaceutical vehicle;
- (3) determining a post administration level of antigen- or pathogen-specific antibody;
- (4) comparing the level of antibody in step (1) to the level of antibody in step (3), wherein a lack of increase or a decrease in antibody level is indicative of suppressing an immune response.

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a<sup>3</sup>

add  
B<sup>3</sup>